Quality Assurance Project Plan for the Brownfields Phase II Assessment of the former Willowbrook Mill Site Addendum 2A, Revision 0

United States Environmental Protection Agency (EPA) Brownfields Assessment Cooperative Agreement
Lincolnton, North Carolina

This document and work performed under this Site-Specific QAPP Addendum 2A is prepared in accordance with the EPA Region 4 Brownfields Program and the Generic QAPP document for the City of Lincolnton approved on TBD.

EPA Brownfields Cooperative Agreement BF-00D72318-0

Prepared for:

City of Lincolnton
Post Office Box 617 (114 West Sycamore Street)
Lincolnton, North Carolina 28093

Prepared by:

Cardno, Inc.
1812 Lincoln St., Suite 301
Columbia, SC 29201
Ph: 803-929-6060

January 29, 2021

Approval:

Cardno Project Manager:

Signature

Brian Kvam, PG

Printed Name / Date

Cardno QA/QC Manager:

Signature

Charles Saunders, PG

Printed Name / Date

EPA Project Officer:

Signature

Sara Janovitz

Printed Name / Date

EPA Designated Approving Official (DAO):

Signature

Sara Janovitz

Printed Name / Date

City of Lincolnton Brownfields Project Director:

Signature

Laura Elam, AICP

Printed Name / Date

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A3. DISTRIBUTION LIST

The following individuals will receive copies of the approved QAPP and subsequent revisions:

- Sara Janovitz, Brownfields Project Officer, EPA Region 4, 61 Forsyth Street, Atlanta, Georgia 30303-8960, Phone: (404) 562-9870, Email: janovitz.sara@epa.gov
- Sara Janovitz, EPA Designated Approving Official (DAO), EPA Region 4, 61 Forsyth Street, Atlanta, Georgia 30303-8960, Phone: (404) 562-9870, Email: janovitz.sara@epa.gov
- Laura Elam, AICP, Brownfields Project Director, City of Lincolnton, P.O. Box 617, Lincolnton, NC 28093, Phone: (704) 736-8930, Email: lauraelam@ci.lincolnton.nc.us
- Brian Kvam, PG, Cardno Project Manager, 1812 Lincoln St., Suite 301, Columbia, SC 29201, Phone: (803) 929-6071, Email: brian.kvam@cardno.com
- Charles Saunders, PG, Cardno Quality Assurance/Quality Control (QA/QC) Manager, Cardno, 10988 Richardson Road, Ashland, VA 23005, Phone: (804) 412-6554, Email: chee.saunders@cardno.com
- Brian Kvam, PG, Cardno Field Team Leader, 1812 Lincoln Street, Columbia, SC 29201, Phone: (803) 929-6071, Email: brian.kvam@cardno.com
- Cardno Field Team Technicians
- Laboratory Director, Terrie Fudge – ESC Laboratories, Inc. 12065 Lebanon Road, Mt. Juliet, TN 37122

A4. PROJECT/TASK ORGANIZATION

Cardno is responsible for conducting and overseeing the Phase II Environmental Site Assessment at former Willowbrook Mill site in Lincolnton, Lincoln County, North Carolina. The information presented in this document represents the minimum standards required for the site assessment under the Town of Lincolnton Brownfields program. A project organization chart is

provided as **Appendix A**. The following are the individuals participating in the project and their specific roles and responsibilities:

Sara Janovitz, EPA Region 4 Brownfields Project Officer - The EPA Project Officer is responsible for overseeing and monitoring the grant. As part of that responsibility, he ensures the processes described in the work plan are followed and the terms and conditions of the grant are met.

Sara Janovitz, EPA Region 4 Brownfields Designated Approving Official – The Brownfields Region 4 Quality Assurance Manager's DAO provides technical assistance to the Region 4 Project Officer working on Brownfields sites. The DAO's role is to provide technical reviews of the Generic QAPPs and Site-Specific QAPP Addenda that are generated. This includes the approval of the Generic QAPP and Site-Specific QAPP Addenda and any revisions.

Laura Elam, AICP, City of Lincolnton Brownfields Project Director – The Lincolnton Brownfields Project Director is responsible for the overall strategic direction of the project. The Director ensures project activities are executed in accordance with the approved Work Plan and the Terms and Conditions of the Cooperative Agreement.

Brian Kvam, PG, Cardno Project Manager – The Project Manager will be the primary decision maker for the project and the primary user of the data to determine whether or not further action is required at the site. He will also coordinate the project activities and his specific responsibilities are:

1. Approving the QAPP and subsequent revisions in terms of Brownfields specific requirements;
2. Overall responsibility of the investigation;
3. Coordinating field and laboratory activities;
4. Conducting project activities in accordance with the QAPP and work order;
5. Validating field data;
6. Reporting to the City of Lincolnton Brownfields Project Director regarding the project status per the work order;
7. Making final project decisions with the authority to commit the necessary resources to conduct the project;
8. Instituting corrective actions for problems encountered in the field sampling activities;
9. Communicating corrective actions to the Field Team Leader to remedy problems encountered in the field and coordinating with the lab director to correct any corresponding problems encountered in the chemical analyses; and
10. Compiling documentation detailing any corrective actions.

Charles Saunders, PG, Cardno QA/QC Reviewer – The Cardno QA/QC Reviewer provides documentation audits and technical review to assist in promoting, implementing, and documenting QA compliance. The Cardno QA/QC Officer is isolated from the implementation Cardno Project Manager. This allows lateral support as a peer to the Cardno Project Manager without introducing unintentional biases from conducting the work.

Brian Kvam, PG, Cardno Field Team Leader, – The field team leader will perform the following duties:

1. Select the field sampling team;
2. Conduct the field activities per the approved QAPP and supervise the field sampling team;
3. Distribute the approved QAPP and subsequent revisions to the members of the field sampling team;
4. Report problems in the field to the Project Manager;
5. Implement corrective actions in the field as directed by the Project Manager. Corrective actions will be documented in the field logs and provided to the Project Manager in the final report.

Cardno Field Team Technicians – These individuals will perform the actual fieldwork per the QAPP and at the direction of the Field Team Leader and Project Manager.

ESC Laboratory Director, Terrie Fudge – The Laboratory Director is responsible for the following:

1. Coordinating the analysis of the samples and selecting the analytical team.
2. Coordinating the receipt of the samples at the laboratory.
3. Ensuring internal laboratory audits are conducted per the Laboratory's Quality Assurance Manual (QAM), and distributing the applicable sections of the QAPP and subsequent revisions to members of the analytical team.
4. Instituting corrective actions for problems encountered in the chemical analyses and reporting laboratory problems affecting the project data to the Project Manager. Corrective actions for chemical analyses will be detailed in a lab report that will be provided via electronic mail.

A5. PROBLEM DEFINITION/BACKGROUND

The City of Lincolnton, North Carolina has been issued a Brownfields Assessment Grant under the USEPA Cooperative Agreement No. BF-00D72318-0. Funding from this grant will be utilized to conduct an environmental site assessment (ESA). The City of Lincolnton is pursuing assessment at the subject property in order to assess the possibility of historical releases, verifying remaining reported contamination, and to facilitate property transfer at the site. The proposed end use of the site includes potential light manufacturing and commercial use.

A5.1 Site Location and Description

The site is comprised of three contiguous parcels, generally located at 215 Bonview Avenue, in a predominately residential and industrial area of Lincolnton, Lincoln County, North Carolina. The site is a former textile mill site that is currently vacant. Access to the site is provided from the north, along Bonview Avenue.

A Site Location Map, consisting of the relevant portion of the United States Geological Survey (USGS) topographic map, Lincolnton West, NC Quadrangle, is included as **Figure 1**. The aerial layout of the site and surrounding properties are depicted on **Figure 2**. The site is located with an approximate center location (decimal degrees) of 35.473019 latitude and -81.260234 longitude.

A5.2 Site Hydrogeology

According to the USGS Groundwater Atlas of the United States (2000), the primary aquifer system in the area of the subject property is the Piedmont Crystalline Rock Aquifer System. The system is composed principally of crystalline bedrock overlain by unconsolidated regolith. Included in the regolith are the following: a) saprolite, which is a layer of earthy, decomposed rock developed by weathering of the bedrock that is largest component of the regolith; b) soil that develops on the upper part of the saprolite; and c) alluvium, which is mainly confined to stream valleys. Typically, the regolith contains both saturated and unsaturated zones. Groundwater in the regolith is stored in and transmitted through openings (pores) between the soil and rock particles. Local flow systems exist within the regolith often providing preferential flow paths in coarser lenses and relic geological structural features in the weathered rock. The crystalline rocks underlying the regolith have an extremely low permeability and porosity. As a result, groundwater is typically found in interconnected vertical or horizontal fractures and within foliations in the rock itself.

Groundwater flow through the saprolite is generally controlled by primary and relic secondary porosity features. Secondary porosity features such as fractures, faults, and weathered zones dictate movement of groundwater in the transition zone. Groundwater movement is generally along short paths from interstream recharge areas to the nearest stream. Surficial groundwater flow direction in this region tends to mimic the overlying topography and is expected to have a predominate flow towards the north-northwest. Previous environmental reports conducted on the site reported a facility-wide groundwater depth of approximately 5.5 feet below ground surface (bgs).

A5.3 Current and Historic Uses of the Site

The site is currently owned by Capitol Funds, Inc., and was observed as vacant.

The subject property has been associated with nearly 10 separate textile companies, since its development as the Willowbrook Manufacturing Company in Ca. 1888. Textile and manufacturing activities appear to have ceased at the site sometime in the 1980s where the property was used for warehousing until approximately 1999. The former mill appears to have been vacant since that time.

A5.4 Previous Site Assessments

A Phase II Environmental Site Assessment (ESA) was completed for the subject property by Trigon Engineering Consultants, Inc. (Trigon). The Phase II ESA report was prepared for Miller & Martin, in Chattanooga, Tennessee, dated August 8, 1991. The assessment included the advancement of seven soil borings, three monitoring wells, two hand-augured soil borings, and the removal of three underground storage tanks located along the southeastern portion of the site. The Phase II ESA identified the following conclusions:

- The area adjacent the former underground storage tanks (USTs) does not appear to be significantly impacted and therefore, no additional environmental assessment is recommended for this area. However, one soil sample obtained from the vicinity of the stormwater catch basin contained 160 milligrams per kilogram (mg/kg) of total petroleum hydrocarbons (TPH), which is above its respective regulatory threshold of 10 mg/kg. Therefore, a “small amount” of soil should be removed from this area, and properly remediated.

- Analytical results from the soil borings advanced throughout the remainder of the site did not identify contaminant concentrations above regulatory thresholds.

- Analytical results from the installed groundwater monitoring wells did not identify contaminant concentrations above regulatory thresholds. However, the concentrations of analytical compounds were below the practical laboratory quantitation limit. Therefore the contaminant concentrations reported were approximate values, and should be resampled.

Additionally, Cardno conducted a recent Phase I ESA on the subject property in March 2019. A summary of the findings of this report are presented below:

- As evidenced in historical Sanborn maps from 1929 - 1941, electrical transformers were historically present in the area of the current-day water tank, and were present well before regulations banning PCBs came into effect. The historical presence of these transformers is considered to be a REC.

- The site's historical general use as a textile manufacturing facility for approximately 80 years from circa 1920 – circa 2000, is considered to be a REC.

- The presence of one (1) aboveground storage tank (AST) of approximately 100-gallon capacity in the western mechanical room is considered to be a REC.

- The presence of former boiler systems and associated petroleum storage in the southeastern boiler room is considered to be a REC.

- A former 20,000-gallon fuel oil AST was present to the west of the main mill building, near the parking area, at the time of the 1991 Trigon Phase II ESA. Based on site reconnaissance, the tank has since been removed. Though a soil boring was taken in the area during the 1991 report, no records of tank removal or closure assessment were provided to Cardno personnel, and it is possible that an undocumented petroleum release occurred between the time of the 1991 report and tank closure. The historical presence a 20,000-gallon fuel oil AST on the subject property is considered a REC.

- The extensive presence of asbestos containing materials (ACM) and lead-based paints (LBP) throughout the main mill building is considered a REC.

Cardno's Phase I ESA also identified the following Historical RECs:

- According to information provided by EDR and an August 1991 Trigon Phase II ESA, a petroleum release occurred at the subject property in 1991 from three former fuel oil USTs of approximately 4,000, 10,000, and 12,000-gallon capacity, respectively. During site assessment it was revealed that site soil had been impacted by historical petroleum release, showing elevated concentrations of total petroleum hydrocarbons (TPH) in the area of a former stormwater drain near the former UST location. The 1991 report indicates that the former USTs have been closed via removal from the ground. As of December 2015, the incident is considered to be "closed out." Based on a review of the provided information, Cardno personnel consider this listing to be a Historic Recognized Environmental Condition (HREC).

- The Lincolnton City Hall is located two city blocks to the southeast of the site, in an upgradient location. According to information provided by EDR, a petroleum release occurred from an above-ground generator in April 2004. During site assessment, it was revealed that site soils had been impacted with concentrations of gasoline-range organics

(GRO), diesel-range organics (DRO), and oil and grease range organics (OGRO) TPH above regulatory criteria. As a remedial action, 1,700 tons of impacted soil was excavated. After the remedial action confirmation sampling revealed that the contamination had been remediated effectively. As of July 2004, the site is considered to be "closed out." Based on review of the provided information, Cardno personnel consider this listing to be a HREC.

A5.5 Contaminants of Potential Concern

Based upon environmental data gathered during Trigon's Phase II ESA, as well as findings from Cardno's Phase I ESA, contaminants of concern include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and the eight Resource Conservation and Recovery Act (RCRA) Metals. Additionally, the former presence of a transformer house on the subject property for at least 50 years prior to the United States ban on Polychlorinated Biphenyls (PCBs), indicates that site media have also been impacted by potential historical release of PCBs.

A5.6 Conceptual Site Model

The purpose of this Phase II ESA is to verify previously identified on-site contamination, as well as to assess potential contamination that could have originated from RECs identified in Cardno's Phase I ESA.

A6. PROJECT/TASK DESCRIPTION AND SCHEDULE

This scope of work has been designed to address the RECs identified in the findings from Cardno's Phase I ESA. In addition to the laboratory analysis of surficial and subsurface soils (critical determinations); non-critical determinations, including soil lithology, and general observations will also be made to aid in the decision making process.

The scope of work described in subsequent sections will be completed in two phases.

1. The initial phase will include assessment of potentially impacted subsurface soils, and subsurface groundwater for presence of contamination.
2. In the final phase, the data collected will be evaluated to determine the need for a second phase of assessment to include additional soil sampling and/or the installation of temporary groundwater monitoring wells. The need for additional assessment will be evaluated with input from all project stakeholders as described in the Section A6.9 of the QAPP. If needed, additional assessment work scopes will be detailed in revisions to this QAPP.

A6.1 Sampling Plan

Soil samples will be collected in accordance with any applicable local, state, and federal laws, and the judgement of qualified Cardno personnel. If field conditions do not allow for pre-determined sampling locations to be utilized, the field team leader will utilize the Decision Tree (included in the Generic QAPP) to determine the appropriate action. All deviations and decisions will be documented in the final Phase II ESA report. Proposed soil sample locations and are illustrated in **Figure 3**. Proposed groundwater sample locations and are illustrated in **Figure 4**.

Table 2 provides a summary of the analysis criteria for each sample including QA/QC samples. The field staff will be provided a copy of this plan for reference while in the field. Boring (if

needed) and soil sample collection activities will be conducted in accordance with the USEPA Region 4 Science and Ecosystem Support Division (SESD) Field Branches Quality System and Technical Procedures.

A6.2 Field Measurements

Seven (7) soil borings will be advanced to approximately six (6) feet bgs, or until groundwater is encountered, in order to collect a subsurface soil sample. During boring advancement, soil cores will be collected at two-foot intervals and analyzed via a Photoionization Detector (PID). Sub-surface soil samples will be collected from the sample interval at which the highest PID reading is detected. If no elevated PID readings are identified, then a sample will be collected between one (1) and five (5) feet bgs, or above the zone of saturation. Soils collected from borings will be logged according to the Unified Soil Classification System (USCS). Temporary groundwater monitoring wells will be installed at four (4) of the soil borings and groundwater samples will be gathered from each installed well. During purging, groundwater will be screened in general accordance with environmental consulting industry standards in North Carolina and the SESD procedures. The groundwater quality parameters temperature, conductivity, pH, dissolved oxygen (DO), and turbidity will be measured and recorded during purging at maximum intervals of one measurement per standing well volume removed.

A6.3 Laboratory Testing

Based on the previously identified RECs, full reportable lists of compounds within the following analytical method categories have been identified for this assessment in the soil and groundwater samples, and include the following:

- Target Compound List (TCL) VOCs by EPA Method 8260;
- TCL SVOCs by EPA Method 8270;
- Resource Conservation and Recovery Act (RCRA) Metals by EPA Methods 6020 and 7470/7473; and
- PCBs by EPA Method 8082A

The listing of accredited analyses, detailing all analytes, is provided in the ESC Quality Assurance Manual (QAM) included as **Appendix A**.

A6.4 Soil Samples (Critical)

As a part of assessment, approximately one (1) soil sample (between 2’ - 5’ bgs) will be collected from each of the proposed soil boring location locations throughout the subject property. The numbers and locations may vary depending upon actual conditions (e.g. subsurface utilities, etc.)

There are no critical sampling conditions (e.g. storm event, seasonal flow conditions, etc.) under which these data should be collected. These data will be used to determine the absence or presence of contaminants of concern (COC) in site soils and will identify the need for additional assessment and/or remediation.

A6.5 Groundwater Samples (Critical)

Groundwater samples will be collected from each temporary groundwater monitoring well (MW-1 through MW-4), as depicted on **Figure 4**.

Groundwater levels will be gauged with an electric water level meter capable of measuring the depth to the air/liquid interface to within +/- 0.01 foot. Water level measurements will be collected from all wells on the Site within a 24-hour period to ensure that the groundwater flow gradient and direction can be accurately determined and are not affected by temporal variability.

Prior to groundwater sample collection, each monitoring well will be purged via the low-flow method using a variable speed peristaltic pump and new dedicated tubing, or with a variable speed, electric submersible pump if groundwater depths prohibit the use of peristaltic pumps. Purging will continue until consistent values (i.e., less than 10% variance between consecutive readings) are obtained for dissolved oxygen (DO), specific conductivity, and temperature, and consecutive pH measurements are within ± 0.2 pH units; or, if drawdown cannot be controlled during low-flow sampling, the monitoring well formation fails to recharge (i.e. the well runs dry). Turbidity will be monitored during purging with a calibrated turbidity meter. These measurements will be collected during the purging process to ensure that representative groundwater samples are obtained.

Monitoring wells will be sampled using low-flow techniques with a variable speed peristaltic pump (or with a variable speed, electric submersible pump if groundwater depths inhibit the use of peristaltic pumps). Groundwater samples will be collected and submitted for laboratory analysis as described above. Sample bottles for VOCs will be filled first, followed by bottles for the remaining additional analyses in order of decreasing volatility. Sample containers will be supplied by the analytical laboratory, and will be pre-preserved by the laboratory in accordance with the analytical method to be performed.

A6.6 Non-Critical Determination

Non-critical determinations made during the soil boring installation/soil sample collection activities will include describing soil characteristics, such as lithology, using the Unified Soil Classification System (USCS) (from ASTM D 2487). This information will be used to supplement the critical data; it is not needed to make the decision of whether or not remediation is necessary.

A6.7 Regulatory Standards

Soil and groundwater samples will be collected in accordance with any and all applicable local, state, and federal regulations, and the judgement of qualified Cardno personnel.

A6.8 Data Use

Soil samples will be collected to provide analytical data site assessment. The significance and nature of impacts to the areas of concern will be determined by direct evaluation of the analytical data generated. If analytes are not detected above EPA-mandated residential and/or industrial Regional Screening Levels (RSLs), then no further action will be required.

If analytes are found above regulatory criteria in the soil, then the degree to which these impacts affect redevelopment of the site must be evaluated. Further assessment and/or an Analysis of Brownfields Cleanup Alternatives (ABCA), which may evaluate remedial actions and/or institutional controls, would then be recommended.

A6.9 Schedule

The anticipated start date for sample collection will be based on the final approval of this Site-Specific QAPP. The field activities will commence within 30 days of QAPP approval. Sample collection and associated field work should take approximately one day to complete. Samples

will be shipped overnight to the laboratory throughout the duration of the project. Laboratory results will be sent to the Project Manager (PM) within fourteen (14) business days of sample receipt. The draft Phase II ESA report will be completed within 30 days after receipt of the laboratory results.

A7. QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The project-specific data quality objectives (DQOs), detailing quantitative and qualitative objectives and limits, as well as measurement quality objectives, are included in **Table 1.**

A8. SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

The following are the minimum training requirements for personnel conducting project activities. Current training records and certificates are kept in personnel files located at the respective headquarters of the project personnel. Deficiencies and the need for new training are identified during annual personnel evaluations. Personnel deficient in any of the following requirements will not conduct project activities.

Hazardous Waste Operations and Emergency Response (HAZWOPER):

The Field Team Leader will ensure that all on-site project personnel have current certificates of training for the 40-hour Occupational Safety and Health Administration (OSHA) HAZWOPER Training Class with annual 8-hour refresher courses. All personnel mobilizing to the site shall carry a Certificate of Training identification card.

Field Team Training:

Field Team Technicians are provided hands-on training in graduated phases of explaining, observing, demonstrating, and performing field sampling techniques and standard operating procedures by experienced field personnel. Additional training in field equipment technologies, quality assurance, ethics, and other skills are provided through in-house instruction, online, and external workshops and courses. Field competency is checked through personnel evaluations with direct input from the field team leaders and project managers.

Certifications:

- Assessment work must be overseen by a NC-licensed professional, and the final assessment reports will be signed and sealed by either a professional geologist (P.G.) or a professional engineer (P.E.) licensed in the State of North Carolina;

- A North Carolina-licensed driller will perform the drilling tasks for this project. Licensure of the subcontracted drilling operator will be confirmed during the solicitation for the drilling services;

- ESC Lab Sciences (ESC) of Mt. Juliet, Tennessee, an NCDEQ-accredited environmental laboratory, will perform the analysis of the environmental samples in compliance will all applicable regulations and standards. ESC's QAM is included as an **Appendix B** in electronic format.

Quality assurance training is of utmost importance for valid handling of data. As such, staff members receive QA training on an as-needed basis by taking online courses as well as

attending professional training when offered.

City of Lincolnton will be responsible for ensuring that their Brownfields program personnel have valid and current specialized training required by the OSHA regulations as a pre-requisite for site visit(s). Additional specific certifications have not been identified as necessary during the planning of this project.

A9. DOCUMENTS AND RECORDS

Documentation and Records requirements are provided under the Generic QAPP document.

B1. SAMPLING DESIGN PROCESS

The assessment will evaluate the possibility of historical release related to the former on-site presence of a transformer house that may have impacted site soils by PCBs.

Approximately one (1) soil sample will be collected from each of the seven (7) soil borings locations throughout the subject property. At each sampling location, one (1) subsurface soil sample (1' – 5' bgs) will be collected. Four (4) of the seven (7) soil borings will be converted into groundwater monitoring wells. One (1) groundwater sample will be collected from each monitoring well.

Proposed sampling locations may be adjusted in the field based on site conditions and features. A proposed Soil Sample Location Map for the subject property is included as **Figure 3**. The type and number of samples required, including the rationale, locations, and sample media are provided in **Table 2**. Cardno personnel will collect the soil samples. Upon completion of the sampling effort, Cardno will produce a report, including copies of all field forms generated, and tables and figures summarizing the soil analytical data.

B1.1 Quality Assurance/Quality Control Samples

Quality Assurance/Quality Control samples to be submitted for laboratory analysis will include one equipment blank, one field blank, and one duplicate soil sample. One temperature blank per sample cooler will be provided by the laboratory. The equipment blank and soil duplicate will be analyzed for concentrations of PCBs. The field blank (aqueous) will be analyzed for concentrations of VOCs and SVOCs. The quality control samples will be labelled on the sample bottles and Chain-of-Custody (COC) forms as appropriate.

B1.3 Authorizations, Permits, and Clearances

On-site activities associated with this project will not commence until the proper authorizations, permits, and clearances are obtained, as applicable. These may include, but are not limited to, the following items:

- The Project Manager will ensure that the property owners have given written legal access to the property prior to accessing the properties.

- At least 72 hours prior to the field activities, the North Carolina 811, Underground Utility Locating Center will be contacted to conduct a utility survey of the subject property. Where possible, a hand auger or post-hole digger will be used for the first three to four feet of borehole advancement before initiating mechanical drilling in order to minimize

the potential for hitting underground utilities. In addition, any site maps available will be reviewed and a geophysical survey will be conducted, if necessary, to locate any underground pipelines, utilities, or structures.

B2. SAMPLING AND ANALYTICAL METHODS REQUIREMENTS

To ensure that potential chemicals/contaminants of concern are identified, the soil samples will be analyzed for the parameters as detailed in Section B1. The proposed soil sample locations for the subject property are depicted on **Figure 3**. **Table 2** provides a summary of sample locations and analytical methods for the respective location. Based on conditions observed during implementation of the field activities, adjustments may be required to the sampling plan.

Cardno anticipates that investigation derived waste (IDW) in the form of soil cuttings from boring installation and groundwater from well purging and sampling will be generated during the assessment activities. Profiling of the IDW will be conducted in accordance with disposal facility permit requirements, including, if necessary, Toxicity Characteristic Leaching Procedure (TCLP) testing if analytical results of soil and groundwater suggest that the materials could be deemed hazardous waste. Based on profiling, the waste will be disposed of properly.

B3. SAMPLE HANDLING AND CUSTODY REQUIREMENTS

The laboratory QAM for ESC is provided in **Appendix B**. All other information pertaining to sample handling and custody requirements is provided in the Generic QAPP document.

B4. ANALYTICAL METHODS AND REQUIREMENTS

Once the samples are received and logged in at the laboratory, the samples will be analyzed by EPA Methods as specified in **Table 2**. The laboratory will supply results of analyses within 14 calendar days (standard turnaround time).

The laboratory will follow the procedures outlined in their QAM (**Appendix B**). The laboratory director will be responsible for overseeing the laboratory analysis and coordinating any corrective actions necessary with the Project Manager.

B5. FIELD QUALITY CONTROL REQUIREMENTS

Quality control samples will be collected during field studies for various purposes which include the isolation of site-effects (control samples) and the evaluation of field/laboratory variability (spikes and blanks, trip blanks, duplicates). One equipment blank, one field blank, one duplicate soil sample and one duplicate groundwater sample will be collected. One temperature blank per sample cooler and one trip blank per cooler containing samples for VOC analysis will also be submitted (provided by the lab).

The equipment blank and field blanks will be analyzed for VOCs, and SVOCs. Duplicate sample analyses will mirror the analyses requested for their respective base samples. The trip blanks will be analyzed for VOCs only. Proposed blanks and duplicate samples are referenced in **Table 2**. All other field quality control requirements are provided in the Generic QAPP document.

B6. LABORATORY QUALITY CONTROL REQUIREMENTS

ESC was selected to provide laboratory analytical services for this Site. The ESC laboratory QAM is included in **Appendix B**. All other laboratory quality control requirements are provided

in the Generic QAPP document.

B7. FIELD EQUIPMENT AND CORRECTIVE ACTION

This information is provided in the Generic QAPP document.

B8. LAB EQUIPMENT AND CORRECTIVE ACTION

The laboratory QAM is provided in **Appendix B**, and all other information is provided in the Generic QAPP document.

B9. ANALYTICAL SENSITIVITY AND PROJECT CRITERIA

Method detection limits and reporting limits for each analytical method are provided in the laboratory QAM in **Appendix B**. Additional information is provided in the Generic QAPP document.

B10. DATA MANAGEMENT AND DOCUMENTS

ESC's QAM is provided in **Appendix B**. Additional information is provided in the Generic QAPP document.

C1. ASSESSMENT AND CORRECTIVE ACTIONS

Information pertaining to Assessment and Corrective Actions is provided in the Generic QAPP document.

C2. PROJECT REPORTS

Information pertaining to project reports is provided in the Generic QAPP document.

D1. FIELD DATA EVALUATION

Information pertaining to Field Data Evaluation is provided in the Generic QAPP document.

D2. LABORATORY DATA EVALUATION

Data qualifiers are assigned by the laboratory if necessary. ESC's data evaluation process can be found in their respective QAM provided in **Appendix B**. All other information is provided in the Generic QAPP document.

D3. DATA USABILITY AND PROJECT VERIFICATION

An ESC Representative will review and verify the laboratory data generated for accuracy according to the ESC QAM. Information on QC procedures is provided in the QAM. The QAM is provided in **Appendix B**. All other information is provided in the Generic QAPP document.

REFERENCES

1. ASTM D2487-17: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

2. Cardno. 2018. *Generic Quality Assurance Project Plan for the Brownfields Phase II Environmental Site Assessments, City of Lincolnton, North Carolina*. October.

3. Cardno. 2020. Phase I ESA – Willowbrook Mill

4. Trigon Engineering Consultants, Inc. 1991. *Phase II Environmental Site Assessment*. Spanco Industries, Inc. Facility

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6. U.S. Environmental Protection Agency. 2002. *EPA Guidance for Quality Assurance Project Plans*. EPA QA/G-5. EPA 240/R-02/009. December.

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9. U.S. Environmental Protection Agency. 1998. *Quality Assurance Guidance for Conducting Brownfields Site Assessments*. EPA 540-R-98-038. September.

10. U.S. Environmental Protection Agency Region 4. 2010. *Brownfields Quality Assurance Project Plans (QAPPs) Interim Instructions Generic and Site-Specific QAPP Addendum for Brownfields Site Assessments and/or Cleanups.* July 2010.

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12. U.S. Geological Survey, 2000, The Ground Water Atlas of the United States, USGS Hydrologic Atlas 730, James A Miller, Editor

LIST OF ABBREVIATIONS

ABCA	Analysis of Brownfield Cleanup Alternatives
ACM	Asbestos containing material
AICP	American Institute of Certified Planners
AST	Aboveground Storage Tank
ASTM	American Society for Testing and Materials
BF	Brownfields
bgs	Below Ground Surface
BS	Blank Spike
BSD	Blank Spike Duplicate
BSA	Brownfields Site Assessment
BSRA	Brownfields Site Rehabilitation Agreement
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
CD	Compact Disc
COC	Contaminants of Concern; Chain of Custody
CTL	Cleanup Target Levels
DAO	(EPA) Designated Approving Official
DEFT	Decision Error Feasibility Trials
DO	Dissolved Oxygen
DPT	Direct Push Technology
DRO	Diesel Range Organics
DQO	Data Quality Objective
e.g.	exempli gratia - for example
ECD	Electron Capture Device
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
FID	Flame Ionization Detector
GC	Gas Chromatography
GC-MS	Gas Chromatography – Mass Spectrometry
GIS	Geographic Information Systems
GPS	Global Positioning Satellite
GRO	Gasoline Range Organics
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPLC	High Performance Liquid Chromatography
HREC	Historic Recognized Environmental Condition
ICP	Inductively Coupled Plasma
ID	Identification
IDW	Investigation derived waste
i.e.	*id est* - that is
IUPAC	International Union of Pure and Applied Chemistry
kg	kilogram
L	Liter
LBP	Lead based paint
LIMS	Laboratory Information Management System

LIST OF ABBREVIATIONS

MDLs	Method Detection Limits
mg/kg	Milligram/kilogram
MIP	Membrane Interface Probe
mL	Milliliter
MTBE	Methyl tert-butyl ether
MW	Monitor Well
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable
NC	North Carolina
NELAC	National Environmental Laboratory Accreditation Conference
NCDEQ	North Carolina Department of Environmental Quality
OGRO	Oil and Grease Range Organics
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polyclorinated Biphenyls
PE	Performance Evaluation
P.E.	Professional Engineer
P.G.	Professional Geologist
PID	Photo-ionization Detector
PM	Program Manager
P.O.	Post Office
PQLs	Practical Quantification Limits
QA	Quality Assurance
QAM	Quality Assurance Manual
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RPD	Relative Percent Difference
RQAO	Regional Quality Assurance Designated Approving Official
RSL	Regional Screening Level
SC	South Carolina
SESD	Science and Ecosystem Support Division
SPLP	Synthetic Precipitate Leaching Procedures
SS	Soil Sample
SW	Solid Waste
SVOC	Semi-Volatile Organic Compounds
SOP	Standard Operating Procedure

LIST OF ABBREVIATIONS

TAL	Target Analyte List
T.B.D.	To Be Determined
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TN	Tennessee
TPH	Total Petroleum Hydrocarbons
TQM	Total Quality Management
USCS	Unified Soil Classification System
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
µg	microgram
ug	microgram
VA	Virginia
VOC	Volatile Organic Compounds

Tables

Table 1
Project-Specific Data Quality Objectives
for the former Willowbrook Mill
City of Lincolnton, North Carolina
Brownfield Assessment

Data Quality Objective	Project Specific Action
State Problem	Real or perceived environmental contamination exists at the subject property associated with recognized environmental conditions (*RECs*), identified as the former presence of a transformer house on the subject property, historical industrial usage, and bulk petroleum storage.
Identify the Decision	The principal objective of this investigation is to provide analytical data to evaluate potential contaminant source areas and exposure pathways. The data and data interpretation will answer the question: "Have the RECs identified on the subject property adversely impacted soil or groundwater at the site?"
Identify Inputs to the Decision	Subsurface soil samples and shallow groundwater samples will be collected to provide analytical data for site characterization as detailed in Sections A6 and B1. Samples will be analyzed for VOCs, SVOCs, RCRA 8 metals, and PCBs.
Define the Boundaries of the Study	Spatial Boundaries: The investigation will be confined to the subject property and will focus on areas and items of concern observed during previous assessment activities. Temporal Boundaries: This assessment must be completed prior the expiration of the Town's funding on September 30, 2021. Financial Boundaries: The assessment of the subject property is being conducted under USEPA Cooperative Agreement Number BF-00D72318-0 and shares funding with other high priority sites. Therefore, the investigative activities must be performed in as cost effective a manner as possible to ensure that all of the sites have adequate funding.

Data Quality Objective	Project Specific Action
Develop a Decision Rule	The significance and nature of impacts to the areas of concern will be determined by direct evaluation of the analytical data generated. If analytes are not detected or are detected in the soil samples at concentrations above EPA-mandated residential and/or industrial RSLs, then the site is eligible for no further action. If analytes are found above regulatory criteria in the soil, then the degree to which these impacts affect redevelopment of the site must be evaluated. Further assessment and/or an Analysis of Brownfields Cleanup Alternatives (*ABCA*), which may evaluate remedial actions and/or institutional controls, would then be recommended.
Specify Limits on Decision Errors	Since variance of the data cannot be estimated at this time and the number of samples is restricted by financial considerations, a confidence limit of the data cannot be established. Results of the sampling data will be reviewed by Cardno to determine if additional sampling and/or remediation will likely be required by the NCDEQ. Cardno will work with the NCDEQ to identify any areas where data gaps may exist before it can be determined how to render the subject property suitable for the intended re-use.
Optimize Design	The work plan is cost-effective and meets the needs of both the stakeholders and the regulatory authority. The scope of work is sufficient to determine levels of contamination present in different environmental media at the site and the receptors they may affect. The sampling is designed to assess areas of environmental concern having the highest probability of environmental impairment based on available information. Each planned data point has justifiable reason for collection. The design was optimized to collect sufficient data to characterize the areas of concern while staying within budget and time constraints.

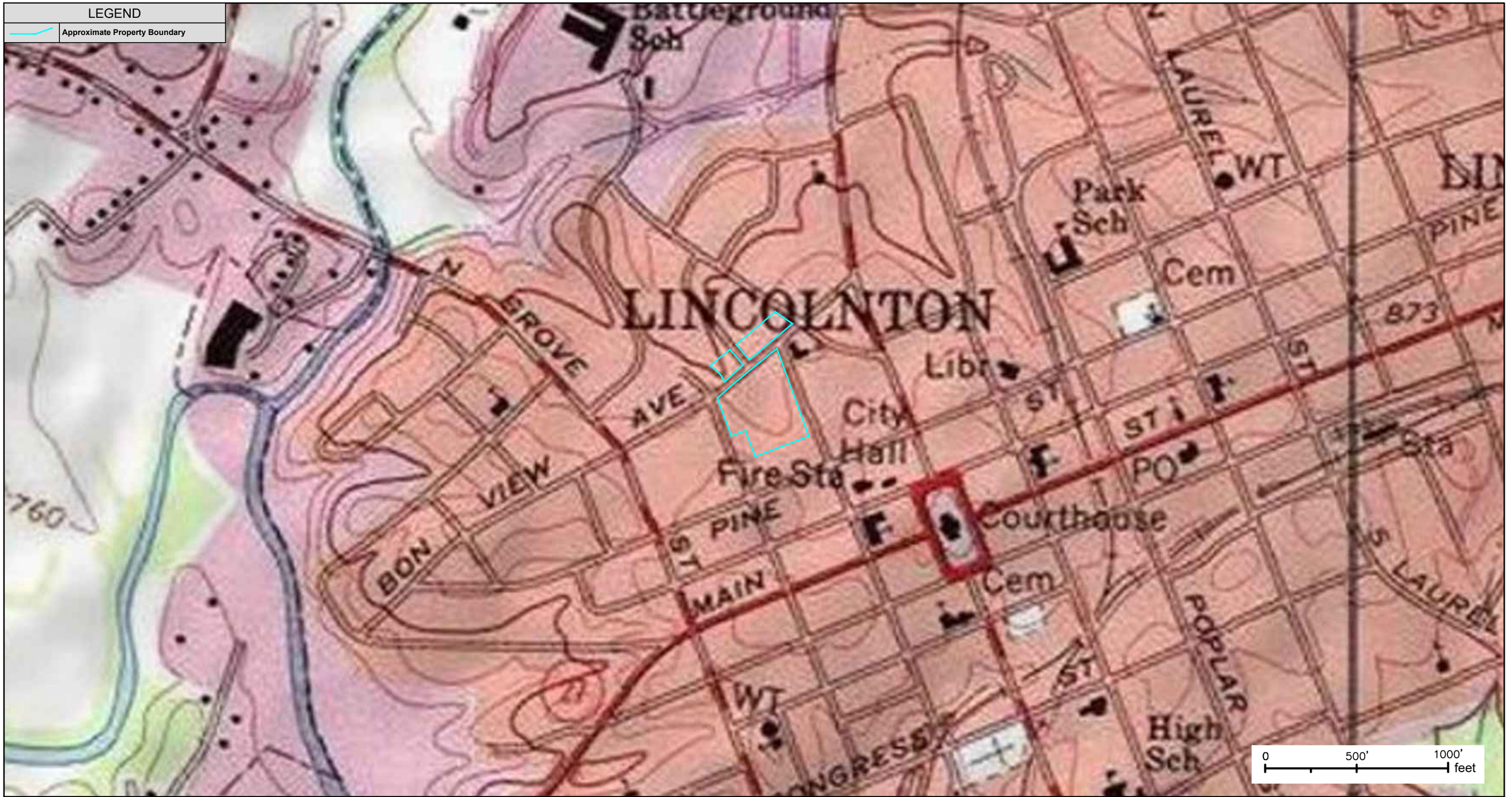
Table 2
Sampling Locations and Analyses Summary
Willowbrook Mill
Lincolnton, NC

Area of Concern	Sample Schedule				
	Sample Media	**Total Samples**	**Analyses**	**Rationale**	**Standard Operating Procedure**
Duke Power Substation *(B-3)*	Soil	1	PCBs by EPA Method 8082A VOCS by EPA Method 8260 SVOCs by EPA Method 8270 RCRA 8 metals by EPA Method 6010	Assessment of subsurface soils for evidence of potential historical releases	SESDPROC-300-R4 Soil Sampling
Former UST Pit *(B-4 & B-7)*	Soil / groundwater	2	PCBs by EPA Method 8082A VOCS by EPA Method 8260 SVOCs by EPA Method 8270 RCRA 8 metals by EPA Method 6010	Verification of historical contamination and assessment of subsurface soils/groundwater of potential undocumented releases	SESDPROC-300-R4 Soil Sampling / SEDSPROC-301-R4
Former 10,000 AST *(B-5)*	Soil / groundwater	1	VOCS by EPA Method 8260 SVOCs by EPA Method 8270 RCRA 8 metals by EPA Method 6010	Assessment of subsurface soils/groundwater for evidence of potential undocumented releases	SESDPROC-300-R4 Soil Sampling / SEDSPROC-301-R4
Former 20,000 AST *(B-1)*	Soil / groundwater	1	VOCS by EPA Method 8260 SVOCs by EPA Method 8270 RCRA 8 metals by EPA Method 6010	Assessment of subsurface soils/groundwater for evidence of potential undocumented releases	SESDPROC-300-R4 Soil Sampling / SEDSPROC-301-R4
General onsite soil conditions *(B-2)*	Soil	1	VOCS by EPA Method 8260 SVOCs by EPA Method 8270 RCRA 8 metals by EPA Method 6010	Assessment of subsurface soils for evidence of potential undocumented releases	SESDPROC-300-R4 Soil Sampling
General offsite soil conditions *(B-6)*	Soil / groundwater	1	VOCS by EPA Method 8260 SVOCs by EPA Method 8270 RCRA 8 metals by EPA Method 6010	Assessment of subsurface soils/groundwater for evidence of potential undocumented releases	SESDPROC-300-R4 Soil Sampling / SEDSPROC-301-R4
Soil Duplicate	Soil	2	PCBs by EPA Method 8082A VOCS by EPA Method 8260 SVOCs by EPA Method 8270	QA/QC	SESDPROC-300-R4 Soil Sampling

Area of Concern	Sample Schedule				
	Sample Media	**Total Samples**	**Analyses**	**Rationale**	**Standard Operating Procedure**
Groundwater Duplicate	Groundwater	1	VOCS by EPA Method 8260 SVOCs by EPA Method 8270	QA/QC	SEDSPROC-301-R4
Field Blank	Aqueous	1	VOCs, SVOCs	QA/QC	SESDPROC-012-R4 Field Sampling Quality Control
Equipment Blank	Soil	1	PCBs by EPA Method 8082A	QA/QC	SESDPROC-012-R4 Field Sampling Quality Control

Notes:
Number of samples may vary due to actual subsurface conditions.

Figures



Notes: Imagery from topoView (https://ngmdb.usgs.gov/topoview//viewer/#4/40.00/-100.00)

Lincolnton West Quadrangle

FIGURE 1: TOPOGRAPHIC SITE LOCATION

Former Willowbrook Mill
Lincolnton, NC

Cardno
1812 Lincoln St., Suite 301
Columbia, SC 29201
803-929-6060

Notes: Imagery from Google Earth

FIGURE 2 - Aerial Map

Willowbrook Mill
Lincolnton, NC

Cardno
1812 Lincoln St., Suite 301
Columbia, SC 29201
803–929–6060

Notes: Imagery from Google Earth

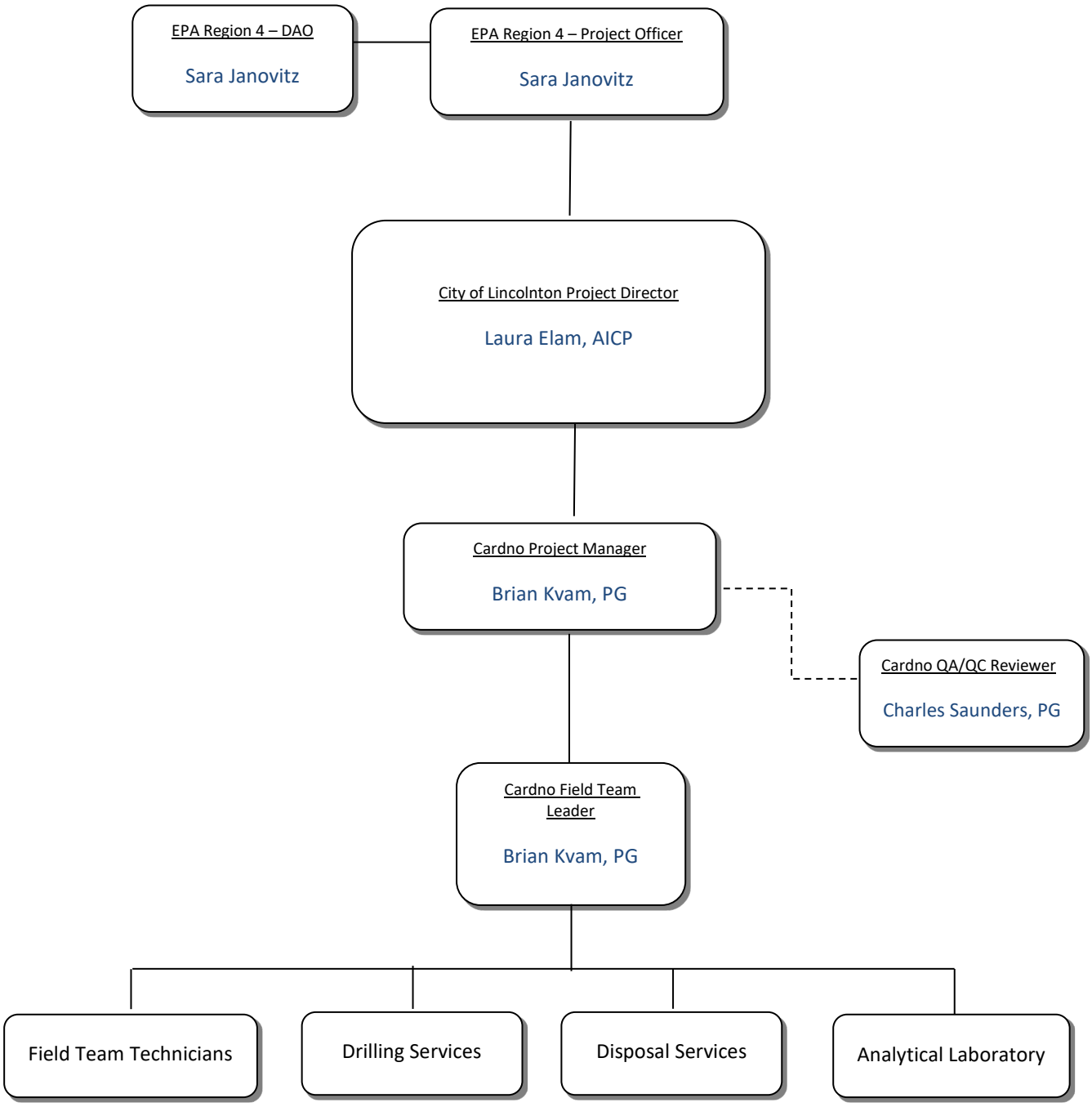
FIGURE 3 - Sample Location Map

Willowbrook Mill
Lincolnton, NC

Cardno
1812 Lincoln St., Suite 301
Columbia, SC 29201
803–929–6060

Appendix A
Project Organizational Chart

Project Organizational Chart



Appendix B
Laboratory QAM